Asparagus

ATLANTIC PROVINCES VEGETABLE CROPS GUIDE TO PEST MANAGEMENT 2002 - 2003

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Table of contents:

Introduction
Crop Establishment
Crop Management
Nutrition
Pests and Pest Control
Harvesting and Handling
Storage and Conditioning
Bibliography
Weeds
Insects
Diseases
Print as PDF

Introduction

Asparagus is a member of the Liliaceae (lily family) and has separate male and female plants. *Asparagus officinalis* is a perennial crop which is productive for fifteen years or more after establishment. It originated along the seacoasts of Europe and Asia and has been cultivated for over 2000 years.

Asparagus is adaptable to temperate regions where low temperature or drought give the crop a rest period. The minimum temperature for germination is 10°C. The optimum range for germination is 16 to 30°C. The optimum temperature for germination is 24°C. The crop does well under cool season conditions; however, the rate of growth is temperature sensitive. The length of time required for the asparagus shoot to grow from 10 cm to 25 cm varies from 5.3 days at a mean daily temperature of 11°C, to 1.9 days at a mean temperature of 25°C. Rhizome buds form at temperatures between 16°deg and 32°C. This plant requires a good water supply but will not tolerate wet soils. Asparagus is frost sensitive so areas subject to late spring and early fall frost, should be avoided if high yield is to be obtained. Dormant asparagus crowns are rarely harmed by winter cold.

The preferred soil is deep, reasonably free of stones and gravel, loose, a fine loamy sand to sandy loam with reasonable organic matter. Good drainage is essential.

Heavy soils such as clay loam should be avoided. A site should not have had asparagus production in the past. This crop requires a rooting depth greater than 1.5 m.

The first asparagus harvest occurs in the spring of the third year from planting (1 year old crowns). A potential yield in the third year would be 1000 kg/ha, in the fourth year 2000 kg/ha, and in the fifth and succeeding years 3000 kg/ha. Recent cultivar trials show large variations between cultivars in yield potential during the first few years but no long term data is available.

Presently asparagus is a specialty crop in the Atlantic area and small amounts are delivered to roadside markets, restaurants and retail stores. However, there is potential for increased fresh market consumption, export potential and also enough land resources for processed asparagus production. (White or blanched asparagus is a specialty crop that can be grown).

Nutrient Content: Very good source of Vitamin A and potassium. Good source of Vitamin C. Contains small amounts of other nutrients including iron. Very low in sodium and calories. 3 to 4 spears provides 10 kilocalories.

Crop Establishment ▲ to Top

Seed harvested from strong, productive parent plants will produce plants that are more productive and less susceptible to disease than those grown from seed taken from weak plants. Seed of older varieties are continually being re-selected for increased performance. Many high yielding F1 hybrid male cultivars are on the market. Male plants are usually higher yielding than female plants within a cultivar.

Seed Treatment - Asparagus seed is soaked for 3 to 4 days at 30-35°C before planting. This soaking softens the seed coat, swells the seed, and starts the germination process which results in earlier emergence of up to one week. There is no advantage if seeding is done into a dry soil.

Seeding/Planting - Asparagus seed should not be planted deeper than 2.5 to 4 cm, depending on soil type and seeding date. Choose a light, well drained sandy loam seedbed with pH about 6.6 and free of perennial weeds. Sow 1 kg of seed per 1000 square meters of seedbed, to produce approximately 25,000 crowns, enough for 1 ha, after plant selection. Select 1 year old crowns the following spring, weighing 30 to 50g.

Permanent field spacing of the crowns should be in rows 1.25 to 1.75 m apart with 30 to 45 cm between plants. This requires approximately 20,000 plants per hectare. Close spacing usually results in higher total yields but the spears are thinner and life of the stand may be shortened. Lift 1 year old plants in early spring. Discard small crowns (under 25 g) and crowns with close-spaced, narrow buds. Grade plants so that similar sized crowns are planted in the same field. Plant in furrows 15 to 20 cm deep, shallower on heavier soils. Spread roots as much as possible, place buds

upward and cover with not more than 5 cm of soil. Fill the furrow gradually by cultivation during the first year. Good weed control will maintain a high plant population and vigorous growth.

Fields can also be planted with asparagus seedlings that are 8 to 12 weeks old. Start transplants in containers or cells that are 5 cm or larger. Use a sterilized media containing half sand and half peat mix. Use normal greenhouse growing practices. Seeds are planted individually in blocks, modules (large) or flats in February. Transplants are planted to the field in late May. Direct seeding may be possible in some situations.

Crop Management ▲ to Top

Establishment - Site selection and preparation should begin two years prior to planting in order to properly adjust the pH and eliminate perennial weed problems. It is essential to maintain healthy fern growth during the first two growing seasons or the crown growth will be restricted and the plants permanently damaged. Weed control during the first season is easily accomplished by slowly filling in the trenches during the season. These cultivations can be timed with flushes of weeds as long as ferns are not covered. During the second year the beds must be kept weed free, especially during the late summer and fall. Weed competition late in the season will restrict crown growth. Close attention must be given to insects and diseases that attack young ferns. As ferns become vigorous and full, diseases can cause the ferns to die prematurely, especially in the late summer and early fall during periods of humid weather. Fungicides can be applied to control this foliage decline.

Mature Stands - After the last cutting of the season, plantings are usually disked lightly for weed control and to incorporate fertilizer. Then the fern is allowed to grow for the remainder of the year.

Asparagus fern growth should not be removed while it is still green as it supplies food to the roots. Ferns should be left to trap snow which protects crowns from low temperature winter injury. The fern can be cut with a rotary or flail-type mower early in the spring and lightly disked into the soil. This can provide 10 to 15 tonnes of organic matter per hectare. All cultivation for fern disposal, weed control and fertilizer incorporation should be shallow and kept to a minimum.

In a vigorous stand the harvest period in year 3 is 1 to 2 weeks, in year 4, 3 to 4 weeks and in year 5 and thereafter 5 to 7 weeks. Harvest should only proceed if the spear size is large. When the size starts to decrease then harvest should stop. Over harvesting results in small diameter ferns which initiate small buds which give rise to small spears the next harvest season.

The fall seeding of rye can be done in late August or early September (if herbicide residues are low). The rye can be burned down with a herbicide in the spring after mowing the fern and before fertilizer is applied. The rye will serve to reduce sandblasting. This may result in a slightly later harvest date. In some fields, this will prevent soil erosion over winter which can be a serious problem in this crop.

▲ to Top

Nutrition

ALL ADDITIONS OF LIME AND FERTILIZER OR MANURES SHOULD BE BASED ON RECOMMENDATIONS FROM A SOIL TEST.

Asparagus responds to manures. Use it prior to planting crowns and with annual top dressings. Not only does it contribute nutrients but also significant organic matter to the soil. Caution should be used with poultry manure as excess nitrogen may be detrimental.

Lime - Lime should be applied to maintain the soil pH in the range 6.8 to 7.0. Asparagus is particularly sensitive to soil acidity which is a frequent cause of crop failure. Heavy applications of limestone must be deeply and evenly incorporated to be sure the crown is surrounded with soil which has a high pH.

Nitrogen - The needs for crown production are lower than in established fields. For crown production half the nitrogen is applied at planting time and half is side-dressed in August depending on weather conditions and the vigor of the stand. For new plantings all of the nitrogen is applied preplant. For established plantings apply half the nitrogen before harvest and half the nitrogen immediately after harvest.

Phosphorus - This nutrient is important to crown producing fields and new plantings. It is important to band phosphorus in new plantings to ensure the stand will be well fertilized in this element as it cannot be effectively applied later. Approximately 450 kg of 0-20-0 mixture should be banded with the crowns per hectare in addition to the recommended broadcast applications.

Potash - Asparagus has a relatively high potash requirement and an additional sidedressing in established fields in early August may increase yields the following year.

Micronutrients - Asparagus has a high *boron* requirement. If a deficiency is suspected apply a soil spray of 1.75 to 2.25 kg of actual boron per hectare or apply a boronated fertilizer. Also, foliar sprays of boron may be used.

Sulfur may be beneficial on sandy soils with low organic matter.

Application Method - Generally in established fields nitrogen, phosphorus, calcium and magnesium are broadcast with shallow incorporation. On newly established fields a wide band over the row may be used for nitrogen and potash.

Pests and Pest Control ▲ to Top

Weeds

Perennial weeds such as quackgrass, must be completely eliminated during the year prior to the planting of asparagus crowns or seeds. During the establishment year use the "stale seedbed technique", whereby emerged weeds are chemically "burnt-off" with a post emergence herbicide prior to crop emergence. Additionally,

herbicide(s) that control germinating weeds (preemergence) can be applied before and after spear emergence.

Established asparagus can be disked in the spring and then treated with one of several residual herbicides prior to spear emergence. Alternatively emerged weeds can be treated with a postemergence "burnoff" treatment and then a residual herbicide prior to spear emergence. A second treatment of herbicide should be applied after the last harvest to provide weed control through the summer.

Diseases

Fusarium Diseases (fungi)

Characteristics - Growing stalks are stunted, yellow and may wilt. Fern growth is also yellow and stunted. Crowns, roots and stems may show discoloration of vascular bundles and varying amounts of decay.

Control - Avoid replanting land which previously grew asparagus. Treat seed and crowns before planting. To avoid injuring the crowns, do not cultivate deeper than 10 cm. Irrigate sandy soil under high moisture stress. Use tolerant cultivars.

Rust (fungus)

Characteristics - This is a potentially serious foliage and stem disease which causes elongated orange red powdery areas on stems and foliage. All commercial cultivars are susceptible to rust.

Control - Disease control is achieved only with thorough spray coverage on a regular schedule once the disease is observed. This spray must protect the new foliage as it grows, before rust spores can land on it and germinate (a 7 to 10 day schedule from late May to late August).

Physiological Disorders

Hollow Stem - This problem tends to be more prevalent during periods of warm, wet weather resulting in rapid spear growth and is found in crops that are ready to be harvested. You may have a problem in specific years with certain cultivars. Plant vigor and spacing may also play a role.

Hooking - This results in bent spears. This problem has many causes but is always because of some sort of injury to the spear - either above or below the ground. Spears will hook into prevailing winds where sandblasting or cold air is a problem. Under the soil, cutworm feeding, cutting knives, stones, etc. can cause severe hooking.

Insects

Asparagus Beetle

Characteristics - The adult beetles are 6 mm in length, blueish black in color with three creamy yellow spots on each wing cover. The larvae are dark gray with black heads. Adults feed on the asparagus shoots. The larvae feed on the leaves and stems.

Control - Apply insecticides as necessary when damage becomes significant.

Spotted Asparagus Beetles

Characteristics - The adult beetles are 6 mm long and reddish-orange with 6 black spots on each wing. They feed on the young shoots and fronds. The orange larvae feed inside the berries.

Control - Leave uncut rows in the spring to serve as traps for the beetles. When temperatures are above 21°C and the beetles are seen on the uncut rows use one of the recommended chemicals.

Cutworms, Tarnished Plant Bugs and Aphids

These insects may cause problems in some seasons but they have not been identified as significant pests of asparagus in this area.

FOR SPECIFIC CHEMICAL CONTROLS SEE THE ATLANTIC PROVINCES "GUIDE TO PEST MANAGEMENT" FOR VEGETABLE CROPS.

Harvesting and Handling ▲ to Top

New plantings can usually be harvested for about 2 weeks in the spring of the third year after field setting. Harvest by cutting or snapping spears at ground level when 18 to 25 cm tall. In established plantings, the harvest season is from about May 20 to early July. Harvesting should be terminated early if emerging spears are too thin to meet the grade standards. Over cutting causes a rapid decline in stand vigor. Harvesting and trimming must be done efficiently if this crop is to be profitable.

Storage and Conditioning ▲ to Top

Asparagus is usually not stored. It can be kept 3 to 4 weeks when hydrocooled immediately after harvest and stored at 2°C. Storage at 0°C for more than 10 days can cause chilling injury. High relative humidity is important to prevent excessive moisture losses. High relative humidity is obtained by placing the butts of asparagus on wet pads or pre-packaging spears in perforated bags. A moisture loss of 3 to 6% will markedly affect the quality. The average freezing temperature of asparagus is -1°C. At 0°C half the initial sugar in an asparagus spear is lost after 2 weeks of storage, at 10°C it takes 1 week, at 20°C it takes 2 days, and at 30°C only about one half day. Spears should be held upright to avoid undesirable curvature.

Controlled atmosphere storage benefits asparagus by reducing decay and toughening. When the temperature can be held between 0°deg and 3°C, 12 2% carbon dioxide and normal oxygen makes an acceptable atmosphere; at higher temperatures the carbon dioxide should be reduced to 7 2%. Exposure of spears to

ethylene which can cause toughening should be avoided.

▲ to Top

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(See also General References)

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▲ to Top

PEST	PESTICIDE (Formulation)	RATE Product	DAYS TO HARVEST	REMARKS
Weeds				▲ to Top
Preplant Perennial Weeds including quackgrass	ROUNDUP 356 Sn	2.5 to 7.0 L/ha	-	Apply in the fall or spring prior to planting. Annual weed control programs will be necessary to control weeds germinating after planting. For quackgrass control apply to actively growing quackgrass when at least 4 new leaves are present. The low rate (2.5 L/ha) will provide a minimum of one season control, while higher rates (4.75 to 7 L/ha) will provide longer term control. The low rate of Roundup should be applied in 50 to 100 L/ha water. If higher water volumes are used add a suitable surfactant. Wait 72 hours before plowing under. Best control of quackgrass is obtained when these herbicides are applied in the fall.
	TOUCHDOWN 480	2.5 to 7.0 L/ha	-	
	GLYFOS	2.5 to 7.0 L/ha	-	
	ROUNDUP TRANSORB	2.5 to 7.0 L/ha	-	
Postemergence Inter-row shielded	GRAMOXONE 200 Sn	2.75 to 5.5 L/ha	-	Do not spray solution on the crop plant since it could be injured or killed. Use Gramoxone for best control of grasses.
	REGLONE 200 Sn	2.75 to	-	

		5.5 L/ha		
Before Emergence of Direct-Seeded Asparagus Germinating annuals	GRAMOXONE 200 Sn	2.75 to 5.5 L/ha	-	Use "stale seedbed technique". Apply in 300 to 1100 L water/ha to foliage of emerged weeds but before the crop has emerged. Gramoxone is more effective on grasses.
	REGLONE 200 SN	2.75 to 5.5 L/ha	-	
	IGNITE 15 Sn	2.7 to 5.0 L/ha	-	Ignite should be applied in 110 to 330 L of water/ha.
	DEVRINOL 50 DF	4.5 to 9 kg/ha	6	Devrinol does not control established weeds and should not be used more than once per year. Can be tank mixed with Gramoxone.
	SINBAR 80 WP	0.375 kg/ha	5	Apply within 2 days after planting. Do not use on gravelly soils. Do not tank mix with Fusilade or injury will occur.
Postemergence Grasses	FUSILADE II 125 EC	0.6 to 2.0 L/ha	-	Apply low rate to annual grasses at the 2 to 5 leaf stage. Apply 2 L/ha to quackgrass at the 3 to 5 leaf stage.
1st Year Crown-Establishment Germinating annuals and quackgrass	DEVRINOL 50 DF	4.5 to 9.0 kg/ ha	6	Apply to crop, preemergence to the weeds.
Postemergence	FUSILADE II 125 EC	0.6 to 2.0 L/ha	-	Apply low rate to annual grasses at the 2 to 5 leaf stage. Apply 2 L/ha to quackgrass at the 3 to 5 leaf stage.
2nd Year and Established Asparagus Germinating weeds	KARMEX 80 DF	2.1to 2.7 kg/ha	-	Disk before shoots emerge in spring on established plantings. This may be followed by the application of one of these listed products. Rain or irrigation will enhance control. A second application can be made after the post harvest disking. **CAUTIONS**: The lower rates should be used on sandy soils. If rotations are planned, these herbicides may carry-over and injure subsequent sensitive crops.
	LINURON:		-	
	LOROX 50 DF	3.3 to 4.3 kg/ha	-	
	LOROX L 480 Su	3.6 to 4.7 L/ha	-	
	FOLAN F 480 Su	3.5 to 4.7 L/ha	-	
	METRIBUZIN:		-	
	SENCOR 500 F Su	2.25 to 4.5 L/ha	14	
	SENCOR 75 DF	1.5 to 3.0 kg/ha	14	
	LEXONE 75DF	1.5 TO 3.0 kg/ha	14	Lexone is recommended for use in ground spray equipment as a preemergence application to established asparagus in early spring before spears of ferns emerge and/or following last cutting *Special precaution:* Do not use on newly seeded asparagus nor on young plants during the first growing season after setting crowns. Do not apply to established crops after fern

				emergence
	SIMAZINE:		-	Apply preemergence to established beds. Make only one application per season.
	PRINCEP-NINE-T	2.5 to 3.75 kg/ha	7	
	SIMADEX	4.5 to 6.7 L/ha	7	
	PRINCEP-NINE-T plus DEVRINOL 50 W	1.2 to 2.4 kg/ha 9.0 to 13.4 kg/ha	7	
Germinating annual grasses,lambsquarters and pigweed	TRIFLURALIN:		-	Apply after the last cutting of spears (post harvest disking) and incorporate as indicated on the label. Use only on established plantings of 3 years or more.
	TREFLAN 480 EC	2.0 to 4.2 L/ha	-	
	RIVAL 60 DF	1.7 to 3.3 kg/ha	-	
	BONANZA 400	2.5 to 5.0 L/ha	-	
Emergence or After Last Cutting Annual Weeds	GRAMOXONE 200 Sn	2.75 to 5.5 L/ha	-	Apply in 300 to 1100 L water/ha to emerged weeds, but before crop emerges or after the last cutting. Use high volume on heavy weed infestations. Does not give residual control and is not effective on perennial weeds.
	TERRAKLENE Su	4.2 to 8.5 L/ha	-	A commercial mixture of paraquat and simazine combining the 'knock down' of GRAMOXONE with the residual activity of PRINCEP. A second application can be made after harvest. Recom-mended only on established plantings. Higher rates should be used on heavy soils, high in organic matter.
Postemergence emerged annual grasses	EXCEL Super	0.67 L/ha	-	Apply to asparagus only after the spears have been harvested. Apply when the annual grasses are in the 1 to 6 leaf stage. Grasses emerging after application will not be controlled.

	FUSILADE II 125 EC	0.6 to 2.0 L/ha	-	Apply low rate to annual grasses at the 2 to 5 leaf stage. Apply 1 to 2 L/ha to quackgrass at the 3 to 5 leaf stage.
Immediately After Harvest is complete Annual and some perennial broadleaf weeds	2,4-D AMINE Sn 500	2.2 to 3.5 L/ha	-	Apply before, during or at the end of the harvest season when broadleaf weeds are actively growing. During harvest spray immediately after cutting to minimize crop injury. After harvest, use drop nozzles to avoid spraying ferns.
After Last Cutting Perennial Weeds	2,4-D AMINE Sn 500	2.2 to 3.5 L/ha	-	Apply as directed postemergence spray in 50 to 100 L water/ha three weeks after last disking.
Insects ▲ to Top				
wireworms	AMBUSH 7EC	146 ml/ha	-	For control of wireworms during the cutting season. Make one application to bare soil after cutting, when damage is first noticed. Apply in sufficient water for good coverage.
Asparagus aphid	DIMETHOATE 480 EC	2.3 L in 675 L of water/ha	-	Apply only as necessary in 3 to 4 week intervals.
	PIRIMOR 50 WP	1 kg in 675 L of water/ha	-	Apply at 3 to 4 week intervals. For mature asparagus after harvest.
	PIRIMOR 50 DF	1 kg in 675 L of water/ha	-	
Asparagus beetle	METHOXYCHLOR 50 WP	1.7 to 4.3 kg/ha	3	Spray when adult beetles are seen and before egg laying begins in spring. Obtain thorough coverage.
	MALATHION 500 EC	2.5 L/ha	1	
	MALATHION 25 WP	5.5 kg/ha	1	
	CYMBUSH 250 EC	140 mL/ha	1	
	SEVIN XLR Plus	2.5 to 6.4 L/ha	2	Use only during harvest, not during fern growth period.
	DECIS 2.5 EC	400 mL/ha	-	Apply postharvest only.
	DECIS 500 EC	200 ml/ha	-	
Diseases ▲ to Top				
Rust	ZINEB 80 WP	1.1 to 3.3 kg/ha	-	Start spraying new, non-harvested plantings as soon as growth is about 30 cm high. For harvested plantings, begin as soon as fern

	POLYRAM 80 DF	2.25 to 3.25 kg/ha	-	growth commences after harvest is complete. Spray at 7 - 10 day intervals. Do not apply to spears to be cut.
	TOPAS	250 mL/ha	-	
Fusarium root & crown rots	BENLATE 50 WP	2.0 g/L	-	Dip 3000 crowns in 100 L solution for 15-20 minutes prior to planting. Ensure seed is treated with sodium hypochlorite prior to planting. Do not plant within 3 years of corn.